DOCUMENT RESUME

ED 282 765 SE 048 191

TITLE	Time Spent on Mathematics Instruction and Homework by Japanese and U.S. 13-Year-Old-Students. OERI Bulletin.
INSTITUTION	Center for Education Statistics (OERI/ED), Washington, DC.
PUB DATE	Dec 86
NOTE	4p.
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Classroom Environment; *Comparative Education; Foreign Countries; *Homework; International Educational Exchange; International Programs; Mathematics Achievement; Mathematics Education; *Mathematics Instruction; Mathematics Tests; Secondary Education; *Secondary School Mathematics; *Time Factors (Learning); Time Management; Tutoring
IDENTIFIERS	*Japan; *Second International Mathematics Study

ABSTRACT

The Second International Mathematics Study compared 13-year-old students from 20 countries in five mathematics content areas. Japanese students ranked first in all five areas. This report compares Japan and the United States on three factors potentially related to student performance on mathematics tests. These include: (1) time spent on mathematics instruction in the classroom; (2) time spent on mathematics homework; and (3) time spent on mathematics tutoring. The data are represented in figures comparing Japanese and United States test responses. Possible test biases are discussed because of the low response rate of the United States sample. (ML)

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FEB 9 1988
4.6-A-3
EC 1.310/2:282765

BULLETIN OERI

U.S. Department of Education • Office of Educational Research and Improvement

Center for Education Statistics

ED282765

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December 1986

Time Spent on Mathematics Instruction and Homework by Japanese and U.S. 13-Year-Old Students

The Second International Mathematics Study compared 13-year-old students from 20 countries[1] in five mathematics content areas. Japanese students ranked 1st in all five areas. U.S. students ranked as follows:

Statistics, 8th;
Arithmetic, 10th;
Algebra, 12th;
Geometry, 16th; and
Measurements, 18th.

This report compares Japan and the United States on three factors potentially related to student performance on mathematics tests: (1) the time spent on mathematics instruction in the classroom, (2) the time spent on mathematics homework, and (3) the time spent on mathematics tutoring. The findings are based on an analysis of data from the Second International Mathematics Study (table). The study was carried out by the International Association for the Evaluation of Education Achievement (IEA).

Time Spent on Mathematics Instruction in the Classroom

Japanese 7th graders spent more days in school but less time in the classroom receiving mathematics instruction than the U.S. 8th graders.[2] The Japanese teachers reported the length of their school year was 240 days, compared with 180 days in the United States.

In Japan, students attended only 4 periods of classroom mathematics instruction in a 6-day week compared with 5 periods of mathematics instruction in a 5-day week in the United States. A typical classroom period for both countries lasted about 50 minutes.

Table—Mean percentage and rank order among the 20 countries by content area, for U.S. and Japanese students

Content area	United States		Japan		Twenty nations
	Mean	Rank	Mean	Rank	Mean
Arithmetic	51	10	61	1	51
Algebra	43	12	61	1	43
Geometry	38	16	60	1	41
Statistics	57	8	71	1	55
Measurements	42	18	69	1	51

Source: Table 15 of the summary report for the United States Second International Mathematics Study, September 1984, and Table 1.6 of the Mathematics Achievement of Secondary School Students-Second International Mathematics Study (National Report of Japan Vol 1) September 1981

[1]For purposes of this study, the 20 "nations" that participated in the Second International Mathematics Study are: Belgium (Flemish), Belgium (French), Canada (British Columbia), Canada (Ontario), England, Finland, France, Hungary, Hong Kong, Israel, Japan, Luxembourg, The Netherlands, New Zealand, Nigeria, Scotland, Sweden, Swaziland Thailand, and the United States.

[2]The study was designed to test students in the grade that contained students of average age 13.0 to 13.11. It turned out the test was appropriate for 7th graders in Japan and 8th graders in the United States.

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Teachers were asked to estimate the number of clock hours of mathematics classroom instruction the students received by the end of the year. Japanese teachers reported a mean of 99 hours a year while the U.S. teachers reported a mean of 147 hours a year.

The range in the instruction time was also smaller among the Japanese teachers than the U.S. teachers. As shown in figure 1, 90 percent of the Japanese teachers spent between 75 and 119 hours in classroom mathematics instruction, while 90 percent of the U.S. teachers spent between 109 and 180 hours.

Time Spent on Mathematics Homework

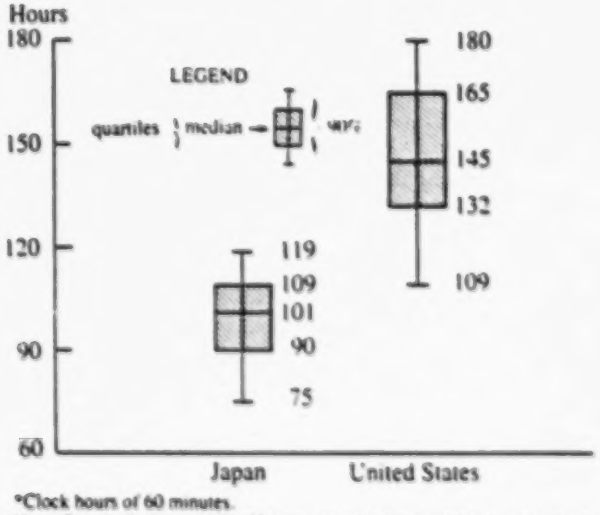
Teachers were asked to estimate the number of hours students needed to complete the assigned homework in mathematics. Students were asked to estimate the number of hours they spent in doing mathematics homework and the number of hours they spent for extra mathematics tutoring.

Teacher estimates suggest that students in the United States are required to do more hours of homework than students in Japan. Specifically, Japanese teachers estimated an average of 1.7 hours a week of assigned mathematics homework, while U.S. teachers estimated an average of 2.6 hours a week (figure 2). Ninety-five percent of the Japanese teachers estimated 3 hours or less for the assigned mathematics homework, while 83 percent of the U.S. teachers estimated 3 hours or less.

Student data, however, suggest that on the average, Japanese students and U.S. students spend about the same time on mathematics homework. Both report an average of 2.6 hours per week. However, about 12 percent of the U.S. students did not spend any time on mathematics homework, compared with only 3 percent of the Japanese students (figure 3).

The time U.S. teachers expected students needed to complete the mathematics homework and the time the students reported they actually spent were the same (2.6 hours in each case). However, for the Japanese, data are not in agreement. Students reported more time doing mathematics homework than the teachers had estimated (2.6 hours vs. 1.7 hours). Whether Japanese teachers underestimated the time needed for completing homework or students overestimated the time they spent is unclear.

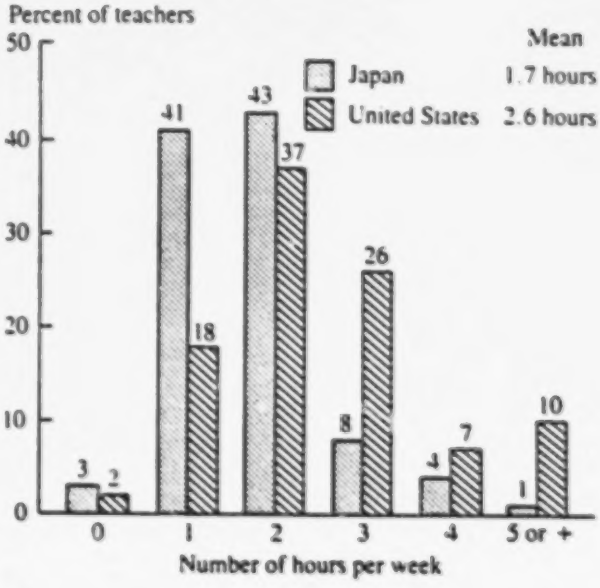
Figure 1.—Teacher reports of hours* of classroom instruction in mathematics received by students in a year



*Clock hours of 60 minutes.

Note: Box includes middle 50 percent of classes. Middle line across box is median. Lines protruding from ends of box show range of middle 90 percent of classes.

Figure 2.—Percentage distribution of teacher estimates of hours per week for students to complete mathematics homework



Time Spent on Mathematics Tutoring

In Japan, tutoring plays an important role in a student's mathematics education. Students spent an average of 2.1 hours a week on mathematics tutoring (from parents or other persons). By comparison, U.S. students spent an average of only 0.4 hours a week on mathematics tutoring (figure 4).

Figure 4 shows that 82 percent of the U.S. students reported little or no mathematics tutoring compared with only 37 percent of the Japanese students. About 30 percent of the Japanese students received 3 hours a week or more of mathematics tutoring, compared with only 3 percent of the U.S. students.

If the hours of tutoring and hours of homework are added, Japanese 7th grade students report spending an average of 4.7 hours a week on mathematics outside of classroom instruction. By contrast, U.S. 8th grade students report spending an average of only about 3 hours a week.

Figure 3.—Percentage distribution of student reports of hours per week doing mathematics homework

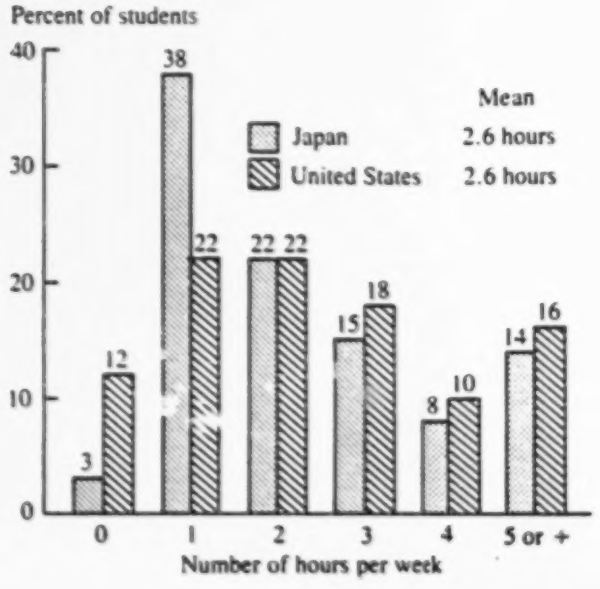
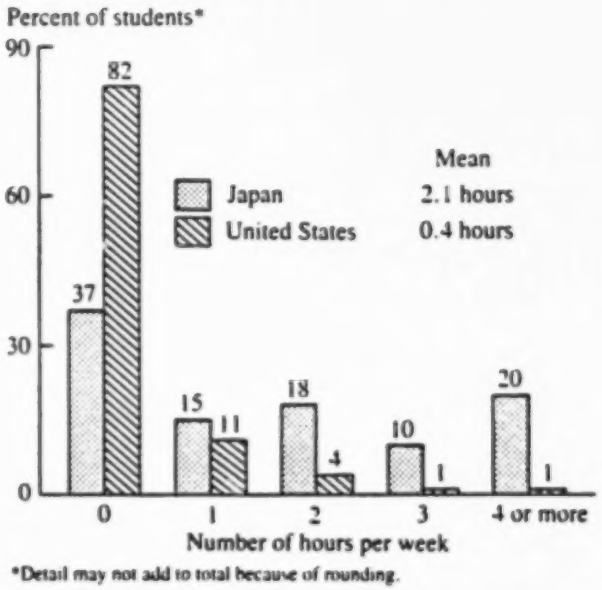


Figure 4.—Percentage of student reports of hours per week of mathematics tutoring or instruction received outside of school



*Detail may not add to total because of rounding.

However, use caution in interpreting the figures for Japanese students. In some cases, mathematics tutoring hours might have been counted twice (once separately and once as part of homework hours). For example, a student who received tutoring on homework might have reported those hours for both activities. Nevertheless, it is clear that Japanese students exceed U.S. students in tutoring, which often is effective in helping students learn mathematics.

Technical Notes

Population and Sample

The data were collected for the Second International Mathematics Study during 1981 and 1982. The population for the analysis was defined by IEA as all students in that grade in which a majority attained the age 13.00 to 13.11 by the middle of the school year. Using this definition, the study population for Japan was students in first-year lower secondary (U.S. grade 7 equivalent) of public school. The students in private schools and schools for the handicapped were not included.[1] There were 226 schools selected for the study, 213 of which participated; one class was chosen from each school. The number of students in the sample was 8,091.

For the U.S. study, a multistage sample design was planned for the population of all 8th grade students in public and private schools. However, only 50 percent of the selected public school districts cooperated and in those districts 69 percent of the public schools participated. Also, only 38 percent of the private schools selected were willing to participate. Due to the low response rate, the weights of the sample were redistributed by post stratification. Altogether, 157 public and private schools participated in the U.S. study. Two classes were chosen from each school producing a total of 6,862 students. The Japanese students in the samples were slightly younger than the U.S. students. At the time of the post-test the average age of the Japanese students was 13.5, while the average age of the U.S. students was 14.1.

Because of the low response rate of the U.S. sample, all the U.S. statistics are subject to possible bias. Statistical comparison should be made cautiously. However, all comparative statements made in this text are likely to be valid because only large differences are cited. Also, some evidence about the direction of possible bias in the U.S. sample suggests that schools not responding to the survey were more likely to have students with lower social and economic characteristics. Thus, a higher school response rate may have produced greater differences with Japan than those shown in this report. Also, the higher average age for U.S. students compared with Japanese students should result in an understatement of the U.S. and Japanese differences.

For More Information

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[1] Japan has compulsory education for lower secondary schools. The students in the private schools and schools for handicapped compose about 4 percent of the student population (Source: *Education Statistics Japan*, Japan Ministry of Education, 1982).